

***Financing Moon Base Facilities and
Infrastructure***
...Sharing Risks and Rewards

Presentation :

***International Conference on Moon Base Colonization
..... A Challenge for Humanity***

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Themes for Today

- **The Environment for Bold New Programs is Changing!**
- **Tougher to Do It Alone!**
- **Co-Investment - Increasingly Important**
- **Increased Use of Public-Private Partnerships**
- **More Special Purpose Fund Sources**
- **Terms will reflect the new paradigm!**

Macro Economic Factors A Changing World

- **Generational Demographics and World Population**
 - 1950 – 16.5 / 1 2000 – 3.4 / 1 2030 – 2 / 1
 - 2005 – 6.4B 2050 – 9+ B
- **Social Security and Medicare**
 - shortfalls by 2017; near-term exhaustion by 2040
 - costs ~ 7 % GDP by 2004; ~ 14% GDP by 2040
- **Global Energy markets ...The End of Cheap Energy**
 - World demand today 86M bbl/day; 109 M bbl/day by 2015
 - Shortfall 2-4 m bbl/day today; 12 m bbl/day by 2015
 - Demand in Asia sky-rocketing ! Competitive marketplace !

Space Industry Heritage ...

... a New Paradigm Emerging

*Government
Focus*

**National Security
Exploration**

**Prestige
Research**

*Industry
Drivers*

**Globalization/
Consolidation**

**Technology
Transfer**

*Evolution
Outcomes*

**Privatization/
Commercialization**

**Partnered
Technology
Development**

NASA's Future Investment Climate

..... Also Changing

- **NASA's biggest Problem ... is "Budget" !**
 - **Budget ~ \$ 16B → \$ 20+ B**
 - **Consumed by STS / ISS / Existing NASA Centers & Workforce**
 - **Science & Research; Technology Development more focused**
 - **New Manned Spacecraft & Launch Vehicle**
 - **Major Existing Program cost overruns**
- **Aged Facilities and Infrastructure**
 - **Requirements for New Builds and Upgrades**
 - **New Approaches to Services/ Facilities Management**
- **New Approaches to Research & Technology**

Aerospace Investment Culture

for Exploration & Technology Development

- **Clear National Strategy** Rationale
- **Primarily Federally Initiated & Program Focused**
- **Strong Technology Objectives & Transfer Programs**
- **History of Government-University-Industry Collaboration,**
- **Effective Intellectual & Real Property Protection**
- **Significant Public Support**
- **Industry and Capital Markets Participation**

Are Capital Markets Interested?

Institutional Investors

- **Capital Follows Markets! Returns!**
- **Capital Follows Self-Interest! ... Advantage!**

Government and Private Investors

- **More willing to follow their Heart!**
- **Prestige, Perceived Public Interest!**
- **More Patient Capital!**

Requirement for New Space Systems / Technologies

- **New Aeronautical/Space Platforms**
 - **Modular/Multi-purpose/Re-usable Spacecraft & Satellites**
 - **New Launch Vehicle & Support Platforms/Facilities**
 - **Unmanned Aerial Vehicles / High Space Systems**
- **Advanced Ground Infrastructure**
 - **New Range Systems, Control & Processing Centers,**
 - **Advanced ATC, FIRST Concepts**
 - **New Flight & Training / Simulation Systems**
 - **New Range / Surveillance Systems & GSE Programs**
- **New Technology Labs & Facilities**

Lunar Applications Focus Areas

- **Scientific Investigation**
 - Environmental & Geophysics – materials,
 - Bio-life sciences – bio-medicine, life support,
 - Radiation & Micro-Gravity
- **Resource Extraction & Utilization**
 - Resource potential
 - Power Systems & Propulsion Fuels
 - Life Support
- **Art of Lunar Colonization**
 - Logistics supply, Construction & Robotics
 - Transportation & Communication

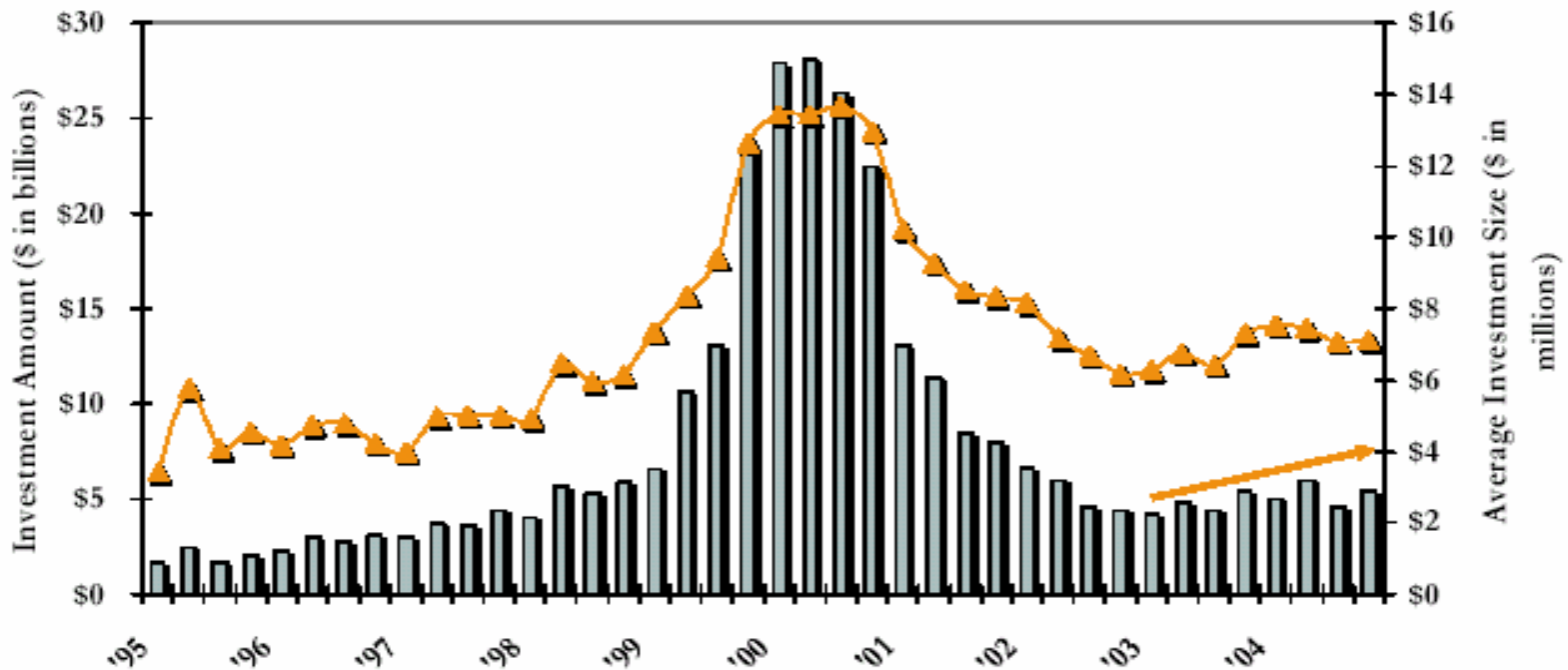
Private Finance Sources for New Aerospace Initiatives

- **Entrepreneurs / Individual Investors**
- **Institutional Equity Investors/Venture Capital**
- **Public Market Equity / IPOs**
- **Vendor Financing / Sharing**
- **Strategic Investment**
- **Commercial Paper**
- **Bonds / Other Debt Instruments**
- **Insurance / Credit Enhancements**

Private Equity Investments

Private equity investment in 2004 has finally reversed a three year decline, with a total of about \$21 billion invested in the U.S....

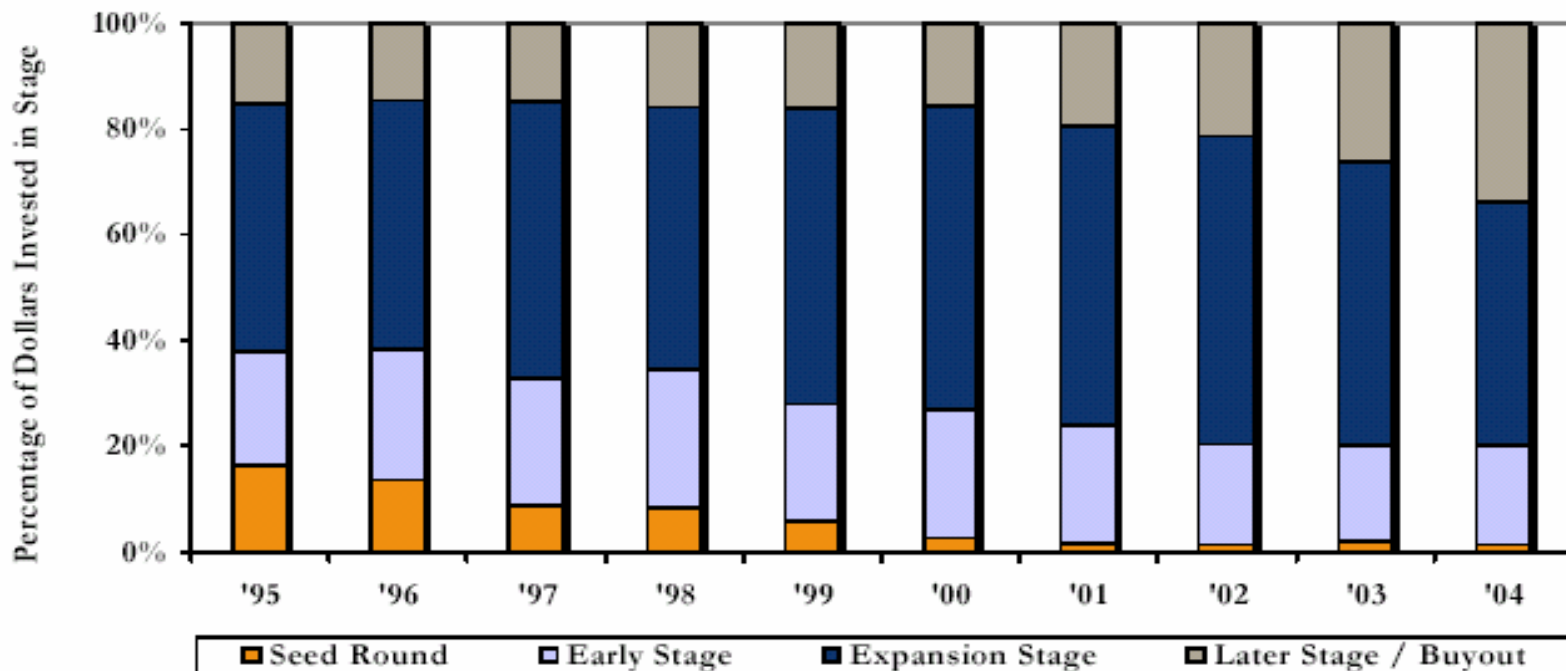
U.S. Private Equity Investment by Quarter, 1995 - 2004



Equity Investing by Stage

The percentage of investment activity in early stage ventures has steadily decreased over the last 10 years, with greater focus on later stage deals

U.S. Private Equity Investment by Stage, 1995 - 2004



Alternative Financing Models

- **Public – Private Partnerships for Finance**
- **Special Purpose Authorities**
 - **Federal, State or Local Community**
 - **TVA, Others**
- **Industry Consortia with Government Charter**
 - **COMSAT, MCC,**
- **Specialized Institutes and Centers of Excellence**
- **Special Purpose Entities or Partnerships**

Other Special Purpose Funds For Technology Development

- **In-Q-Tel, Focused on select areas of Interest**
 - **Strong Co-investment criteria**
- **NASA Venture Fund (Mercury or Red Planet”)**
 - **Funded at \$5 M / year for 5 years**
 - **Very Specific Mission Areas – co-investment interest**
- **US ARMY Venture Fund**
 - **Focused on Promising Lightweight Battery technology**
- **JPL, Sandia, Livermore, Air Force**

Innovative New Approaches

- **Lunar Mutual Fund**
 - **Responsive to Demonstrated Public Support**
 - **International Subscription base**
 - **Legacy Interests - Pride**
 - **Patient Capital , but Promise Essential!**
 - **Must Have Exploitation Access**
- **Explorers Endowment Fund**
 - **Estate & Trust Fund donations**
 - **Legacy Investing - Pride**

Innovative New Approaches

- **Lottery–based Prize/Foundation Funding**
 - **National and International base**
 - **Sharing between Prize awards and Project funding**
- **Explorers Foundation Fund**
 - **Membership based, Benefits to members**
 - **Funding to select Lunar Projects**
 - **Must Have Access to Returns Potential!**

Summary

- **Lunar Colonization will be Attractive to financial markets**
 - Sources will vary with time & maturity!
- **Tough to Do It Alone - Partnerships Essential!**
- **Co-Investment - Increasingly Important**
- **Increased Use of Public-Private Partnerships**
- **More Special Purpose Entities and Funding Sources as Real Partners**
- **Terms will reflect the new paradigm!**
 - Must provide Access to Returns!